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#### Weather, Land Satellite Sale

President Ronald Reagan announced on March 8 plans to sell to private industry the nation's land and meteorological ree-sensing satellites, including the responsibility for any future occan-observing sys-tems. According to the plan, the private firm successful in its bid to buy the five satellites would sell back to the government the data received by the satellites. The Reagan administration says the sale will save money and will put activities appropriate for commercial ventures into the commercial sector. Response to the announcement from scientists and congressmen has been anything but dulcet; one senator, in fact, charges that the Commerce Department and the corporation most likely to purchase the satellites are engaged in a 'sweetheart deal.'

Immediate concerns expressed by scientists and congressmen over the sale of the satellites include the potential for interruption of service resulting from corporate financial difficulties or labor disputes; the possible disruption of information flow to international users of U.S. satellite data; the possibility of data being subject to copyright; and the question of a commercial satellite company having a monopoly on the satellite data essential to the U.S. government. Critics also question whether the government will save any money by selling the LANDSAT land remote-sensing satellite, the two polar orbiting satellites, and the two geostationary operational environmental satellites (GOES).

The National Weather Service (NWS), within the Commerce Department's National Oceanic and Atmospheric Administration (NOAA), would not be dismantled or sold, according to NOAA Administrator John V.

The plan to sell the satellites, according to NOAA officials, was prompted by the Office of Management and Budget (OMB); OMB wanted to eliminate the costly LANDSAT program, which supplies information used by, among others, seismologists, geologists, farmers, and urban planners. However, because the market for the LANDSAT data is small, commercial ventures were reluctant to buy the satellite but were more interested in purchasing the weather satellites, thereby buying into the huge market for weather in-formation. According to one current esti-mate, the public spends \$100 million a year accessing prerecorded telephone weather information, and the media spends \$1.7 billion to disseminate weather information. NOAA Administrator Byrne noted that bids would be accepted only from U.S. firms and would be accepted for either the weather satellites, the land satellite, or all of the remote-sensing

The Communications Satellite Corporation, better known as Comsat, is considered the frontrunner among the firms that would be willing to buy the remote sensing satellites. In fact, Comsat made a proposal to the government in the spring of 1981 to purchase both the land and meteorological satellites. That proposal reportedly states that Comsat would be willing to buy the satellites if the government would guarantee that it would pay roughly \$300 million a year for 15 years. In a statement issued in response to Reagan's anouncement, Comsat said that 'such a transfer is possible without a disruption in the service provided to national and international users and will ensure the continued development in the U.S. of this very important [satelite) technology.' A Comsat spokesman said it would be premature to comment on any possible savings that might accrue to the government as a result of the sale.

Much of the criticism of the plan stems

## BE **IMMORTALIZED** N COTTON AND POLYESTER

#### See Your Slogan on an AGU T-Shirt

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ysis to determine if the government would in-deed save money by selling the satellites. At a Editorial

from the apparent lack of a cost-benefit anal-

March 14 Senate hearing on the NWS budget, Sen. Larry Pressler (R-S.D.) revealed that

the Commerce Department was sent a report

in November from the Department of De-

Space Administration (NASA) claiming that

e government would spend more money

buying back weather and land data from pri-

the government kept the satellites. In spite of this report's analysis, Pressler says, the Rea-

gan administration has gone ahead with plans

to sell the satellites. The South Dakota sena-

tor accused the Commerce Department and

Dated November 10, 1982, the report re-

Deputy Secretary of Commerce Michael Bay-

er from Major General Earl G. Peck of the

Defense Department and Kathleen Charles of

NASA. According to Kevin Schieffer, legisla-

tive assistant to Pressler, the report is a

'broad-base analysis' based on reports re-

quested from more than a dozen companies

on the pros and cons of the commercializa-

the existence of the report, or any other

tion of land and weather satellites. However,

study on the cost effectiveness of selling the

satellites to the private sector, was not known

testifying in mid March in House and Senate

hearings on the proposed fiscal 1984 budget for NWS. Though labelled 'official use only,'

etary information, Schieffer said. Pressler has

Commerce, Science, and Transportation ask

Bayer to make the report available to scien-

tists and others for evaluation of the costs

and benefits of commercializing the remote-

sources Observation Systems) Data Center,

merce from transferring the ownership or

management of any civil land or meteorolog

cal remote sensing space satellite system and

ressional approval. Rep. Roy P. Dyson (D-

associated ground equipment without con-

Md.) introduced a companion bill (H.R.

1958) in the House on March 8, the day of

Reagan's announcement. Both bills have been

sent to committee. Hearings on the proposal have not been scheduled, but are likely to be

held in late spring following budget delibera-

UCAR Group Urges

A blue-ribbon panel of scientists has proposed a decade-long, \$1 billion program to improve forecasting operations and research of regional and local hazardous weather. The

panel, appointed by the University Corpora-tion for Atmospheric Research (UCAR), be-

lieves that the program could reduce the \$20-

billion annual cost of damage from severe

weather by \$1 billion per year.

The primary aim of the program is to 'en-

able weather services, public and private, to

observe and predict stormscale weather plie-

nomena-such as squall lines, thunderstorms

tect the public, serve the national economy, and meet defense requirements, as explained in the report, The National STORM (Stormscale

Operational and Research Meteorology) Program:

A Call to Action. Stormscale phenomena also include nonviolent weather: freezing rain,

dense ground fog, low-lying clouds that dis-rupt ground or sir traffic, persistent tempera-ture inversions, and strong nocturnal cooling

Stormscale phenomena are closely related

to large-scale weather, according to George

S. Benton, professor of meteorology at the Johns Hopkins University and chairman of

the UCAR committee, who testified before

sources, Agricultural Resources, and Environment on March 9. 'It is the distribution of

the House Subcommittee on Natural Re-

large-scale cyclones and anticyclones-low

and high pressure areas—that determines

whether a broad region has predominantly stormy or fair weather. But it is the occur-

rence, he continued, of stormscale phenon-

ity within the stormy region that experiences the devastating flash flood or the destructive

windstorm. Stormscale phenomena are em-

bedded within the large-scale weather pat-terns, and it is often the specific location and

time of occurrence of the stormscale events

that are of the greatest concern to our citi-

The operations portion of the National

STORM Program alms to deploy the technol-

ogy essential to gathering, analyzing, predict-

ing, and disseminating small-scale weather in-

formation; the research portion, on the other

hand, would ensure that the new-generation. high-technology operational system would be used to its maximum benefit. The research

portion of STORM also aims to train fore-

casters to use the new predictive techniques.

ena which determines the particular [sic] local-

that may produce killing frost.

flash floods, local heavy snows, or tornadoes-with the accuracy and reliability to pro-

**STORM Program** 

introduced into the Senate on February 15 a bill (S. 480) to block the Secretary of Com-

Pressler, whose home state is also home to the Interior Department's EROS (Earth Re-

sensing satellites.

the Peck-Charles report contains no propri-

requested that the Senate Committee on

to any of the more than a dozen witnesses

Comsat of being involved in a 'sweetheart

ferred to by Pressler was sent to Assistant

vate companies than would it would spend if

fense and the National Aeronautics and

## On Beginning A Career

At the 1982 AGU Fall Meeting, about 50 young men and women attended a panel discussion entitled 'Doubts and Disigements: Beginning a Career' sponsored by AGU's Education and Human Resources Committee. The panelists (Joyce Blueford, U.S. Geological Survey; Constance Sancetta, Lamont-Doherty Geo logical Observatory; and Percy Donaghay, University of Rhode Island) focused the wide ranging discussion on the special problems of graduate study and early pro-

essional life. Blueford urged students to assess all of the possible careers. Too often students are exposed only to the academic teaching and research role. She suggested that each person periodically outline his or her own priorities and lifestyle to see what type of ob fits, pointing out that one's desires and deas change as one develops. To find out about job advantages and drawbacks, she suggested that one should contact graduates of one's school to see what they have done. Once the job type is determined, the young person must develop the right image, work hard, and make contacts to get ahead. Sancetta discussed some of the prob-

lems encountered by graduate students. She felt that some drop out because they are uncertain of the direction in which they want to go. Others doubt their own ability to do creative, independent science. She stressed that these doubts are common to everyone, and that goals and confidence solidify as one advances. Another common feeling is that of being ignored and getting little support from advisors— the 'l don't get no respect' syndrome. The nudent feels isolated and thinks that no one really cares how he or she is doing. It is important to talk about these feelings and ask for help, she said. 'The faculty may be more supportive than you think, but they don't automatically know how ou feel; you must go and tell them."

Donaghay outlined the problems of the young professional trying to become es-tablished in a crowded field. He suggested that if one goes for 'hard money' (income provided by guaranteed salary) in aca-demics, it means taking a heavy teaching load, which eliminates most of the research time, only to be told at promotion time that 'teaching counts for nothing; promotion is based upon publication.' Pery advised future assistant professors to rheck the history of promotion at each school, since standards differ. A 'soft mor ey (income contingent on grants) research job is often an umbrella project, in which several young scientists cooperate under the guidance of a senior scientist. This is very appealing; someone else worries about the funding while you are doing exciting work on the cutting edge, but the young scientist runs the risk of becoming an 'et al.'

'You must identify yourself as a unique

scientist doing unique work,' said Donaghay. This can be done by giving talks at meetings and seminars at other institu-tions and by publishing papers on which you are sole author. I-lowever, as you begin to define yourself you will come in conflict with established people whose ideas you question and with whom you start to compete for funding. 'You are bound to step on a few toes sooner or later if you do exciting work, and you will have to realize that that's the way science grows and not be crushed by the fights

Remarks by members of the audience brought out several points. An older woman suggested that young scientists adopt a mentor, an older and more experienced person willing to give advice, introduce one to senior colleagues, and explain how the system works. Several people noted that nice guys can finish first; that it is possible to be successful and self-confiden while retaining a concern for others. Most students in the audience seemed to see their advisors as insensitive egotists making rigid demands; many expressed a desire that faculty give those who will not go into academics more information on alternative careers. Dr. Barbara Emery of the National Center for Atmospheric Research said that she had found teamwork boring when she performed only her part of the routine; once she took the initiative to shoulder more responsibility she enjoyed it much more. Dr. Louise Levien of Exxon Production Research Co. urged people not to give up if the first job is disappointing. 'Give science another chance n another place before you decide it's not

A problem which was discussed at some length is one of concern to young women: the apparent impossibility of sustaining a full-time, demanding job and also having a family. Aside from the personal joy of having a family, it was felt that parenting is an important contribution; but the system at present does not allow for parttime workers, who may produce less per year but are still doing valuable research. A different standard of promotion or award might be applied to such people, although it is hard to know what the standard might be; it would represent a basic change in the system. Those women who have been most successful have either been young when they had children and then worked very hard to catch up, or had children after they had become established. The panel cautioned young women not to set unreasonable goals for themselves, but to find a workable way to satis-

ly both parts of their lives. The Committee plans to hold another panel at the 1983 AGU Spring Meeting, with speakers from academia, government agencies, industry, and consulting firms to discuss the relative advantages and drawbacks of various career directions.

> Constance Sancetta, Member Charles Hollister, Chairman AGU Education and Human Resources

'Accurate stormscale weather forecasting will become a reality provided that the tech nology available to weather services is improved in four fundamental ways' under the operational part of the STORM program, the UCAR committee states in its report. First, existing remote sensing systems must be better utilized to improve the observation of stormscale weather systems. In particular, a modern radar network is needed. Second, better communication and processing systems must be made available to the forecaster, the committee contends, to permit the rapid and accurate display and analysis of local weathe information from several sources. Radar or satellite pictures, for example, would show the development and movement of stormscale phenomena. Third, forecasters need better conceptual and numerical models to provide a stronger foundation not only for short-term forecasts, but also for application to forecasts of greater than 12 hours. Last, the committee says that equipment and systems must be installed to help forecasters prepare and rapidly distribute stormscale weather predictions that would be meaningful to the

According to the recently published report, the six-plank research program aims to (1) improve understanding of local and regions weather phenomena and to apply this knowledge to a variety of closely related fields; (2) develop and evaluate local and regional weather prediction models; (3) develop stormscale monitoring and forecasting cap bilities applicable to data-sparse areas; (4) develop and test new observing systems; (5) test and evaluate systems of data assimilation, ar-chival, and display; and (6) develop techhiques of educating and training meteorologists in stormscale weather forecasting.

rapidly by trained meteorologists to those people who need and use them, he noted. The UCAR committee believes that three key ingredients have primed meteorology for a successful stormscale program: 'vastly improved understanding of and ability to prediet the large-scale motions of the atmosphere'; the technology 'to observe, analyze, tion with a level of sophistication substantially greater than would have been possible only

ten years ago'; and the 'availability of im-

program and closely link the research and

recent press conference to unveil STORM.

of no value unless they can be transmitted

operations portions, Benton emphasized at a

No matter how good the predictions, they are

proved computers." At least seven major federal departments and agencies would be closely involved with the program: the departments of Commerce (in particular, the National Oceanic and Atmospheric Administration), Defense, Interior, and Transportation, the Environmental Protection Agency, the National Aeronautics and Space Administration, and the National Science Foundation (NSF). The UCAR committee encourages these agencies and departments to establish a program coordinating office as the next step in the STORM program's development. The committee also recommends that a scientific organizing committee be established within the National Academy of Sciences within the next few months and that a program advisory commit-tee be assembled within 1989 for more detailing program planning. UCAR, a consortium of 50 universities that manages, under contract with NSF, the National Center for Atmospheric Research (NCAR), was a catalyst in

eveloping the National STORM Program. During 1983-1988, the first of three pro-The three latter objectives are vital to the

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posed program phases, the first multi-scale field experiment would be planned, a small field program with limited objectives would be conducted, and data sets would be analyzed. During the second phase (1987-1991), the later multi-scale field experiments would be planned and conducted, and analysis of the data from these experiments would begin. The last phase of the program (to extend as late as 1995) would see the analysis of the data from all of the experiments completed Throughout the entire period, other research—including modeling studies, technolo gy development, and the transfer of informamunity—would be conducted.

In addition to chairman Benton, the National STORM Program committee also includes Ernest M. Agee (Purdue University); Richard A. Anthes (NCAR); Lance F. Bosart (State University of New York at Albany); Michael Fritsch (Pennsylvania State University); Peter V. Hobbs (University of Washington); John Hovermale (National Meteorological Center); Robert McClatchey (Air Force Geophysica Laboratory); Isidoro Orlanski (Geophysical Fluid Dynamics Laboratory); Frederick Sanders (Massachusetts Institute of Technology); Robert J. Serafin (NCAR); Patrick Squires (NCAR); and Verner E. Suomi (Uniersity of Wisconsin-Madison).—BTR

#### Sunspots Affect Insolation

The notion of a rigorously constant amount of solar radiation reaching the earth was upset recently by a team of scientists at the National Center for Atmospheric Re-search (NGAR). John Eddy, Ronald Gilliland and Douglas Hoyt of NCAR's High Altitude Observatory report that sunspots, which speckle the sun's surface in a fluctuating 11year cycle, diminish the amount of sunlight reaching the earth. Their conclusion, which may radically affect global climate modeling, is based on data gathered from the Solar Maximum Mission (SMM) satellite and their own solar blocking model.

Data collected by the SMM satellite reveal that only a small fraction of the energy blocked by sunspots is balanced by immediate, enhanced emissions from bright areas on the sun. Moreover, solar energy can remain trapped in the sunspots, which have an average diameter of 9000 km, for years. Blocked radiative energy can be stored in the lower convective zone of the sun and have a 'relaxation-time scale' of 100,000 years, during which time it may slowly seep out. Fluctu ing solar output affects the accuracy of global climate models that forecast long-term effects on the world's weather: Weather and climate are determined by the circulation patterns of the oceans and air, which are driven by solar energy coupled with the rotational inertia of

the spinning planet.
The NCAR scientists compared data obtained from the Active Cavity Radiometer Irradiance Monitor (ACRIM) aboard the SMM satellite with terrestrial surface temperature data and, using their solar blocking model, successfully duplicated the patterns of energy fluctuations. They can now predict the shortterm excursions in solar radiation a few days in advance, the scientists say, based on measurements of sunspot areas and their locations along with the known rotational properties of the sun. In addition, they can reconstruct the history of past fluctuations in solar radiation from the archived sunspot data of

Launched February 14, 1980, the SMM satellite has detected variances of 0.1% in solar energy output. Such fluctuations correspond to a change of 10 °C in the average temperature of the sun, which is 5700 °C. If the variance is persistent, the scientists say, the carth's surface will respond directly and predictably: global cooling will follow a decrease in solar radiation and global warming will fol-

Theoretically, fluctuations in the release of iolar energy can affect climate profound! (Eos, August 26, 1980, p. 596). Mean global temperatures would drop more than I °C in response to a 1% decrease in output of solar radiation. A drop in output of energy of only 6% would cover the entire earth with ice.—

## Long Valley Earthquakes Wane

The intense awarm of carthquakes that began January 6, 1983, in the Long Valley retion of eastern California continues to abate. The rate of enriliquakes of magnitude 1 or greater (Richter scale) fell to 24 per day by February 8, compared to 100 per day in late January and 1000 tremblers recorded on January 7. Prior to the current awarm, the average daily number of magnitude 1 or greater quakes was 8-10. The area has experienced more than eight seismic swarms since the four magnitude 5.6-6.1 carthquakes of May 25-27, 1980, that occurred in the southern part of the Long Valley caldern. Early ground deformation measurements indicate

limited movement of magma deep within the

However, despite the current abatement recent brief flurries of activity were recorded when two magnitude 4 and one magnitude 3.5 earthquakes occurred on February 3 and 4, respectively. In addition, a magnitude 4.1 earthquake was recorded on February 24.

The seismic activity that began in January has resulted in ground extensions of 9 cm in 6 km and uplifts of 8 cm as indicated by laser-distance measurements and precision surveying. According to U.S. Geological Survey (USGS) seismologist David P. Hill, the changes are more pronounced near the epicentral region which is 3 to 8 km east of the town of Mammoth Lakes. The town is located on the southwest edge of the 17 km by 32 km

elliptical caldera. Spasmodic tremors also have been recorded at this site. Volcanologists consider spasmodic tremors as indicative of rock fracturing caused by the movement of magma or magmatic gases (Science, June 18, 1982, p. 1802). Reanalysis of the May 1980 earthquakes indicates that they were the result of a rapidly expanding crack that immediately filled with fluid. A USGS preliminary model to account for the latest deformation suggests movement of up to 20 cm on the seismically defined fault zone, accompanied by up to 76 cm of opening within that zone. The right-lateral slip movement is

Previous seismic studies revealed the existence of a magma chamber near the town of Mammoth Lakes. Approximate measurements place it at a depth of between 8 km and 15 km and a distance across of 10 km. The 1980 tremors and the appearance of steam vents in January 1982 in the caldera region indicated to researchers that magma from deep in the earth was moving upward (Science, June 18, 1982, p. 1302).

consistent with the seismically determined

mechanism for the earthquakes according to

Despite the recent decline in seismic activity, the Long Valley-Mammoth Lakes area remains covered by a notice of potential volcanic hazards issued by the USGS in May 1982. The region also is under an earthquake hazards watch, which has been in effect since

#### Wet February for Nation's Streams

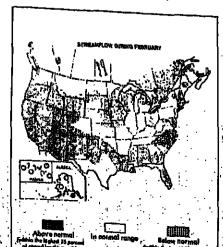
February marked a very wet month for the nation's streams with 97% of the key index gaging stations across the country reporting average to above-average streamflow, according to the U.S. Geological Survey.

USGS hydrologists said that the only stations that reported below-normal conditions for February were one gaging station each in New York, New Jersey, Ohio, and Alaska and all four of the key index stations in the Ha-

The near drought conditions on the Hawaiian Islands were a strong contrast to the generally wet conditions across the continen ial United States. All four of the key index gaging stations on the Islands reported streamflows well below average for February. On the large Island of Hawaii, the key index gage on Waiakea Stream near Mountain View reported several days of zero flow during the month. Kilauca Volcano, located on the Island of Hawaii, has erupted several times during the past two months, and the lack of moisture combined with the intense heat from the lava flow increased the threat of

egetation fires on the island. As an indication of the nation's generally plentiful water picture, combined flow of the nation's 'Big Five' rivers—Mississippi, St. Lawrence, Columbia, Ohio, and Missouri averaged 889 billion gallons a day (bgd), 11% we the long-term average for February. The Big Five, which together drain more than half of the conterminous United States, provide hydrologists with a convenient check

on overall national water conditions. February marks the ninth straight me that the combined flow of the Big Five has been above average. Near the end of February, total daily flow of the Big Five was running 24% above the long-term combined monthly average, indicating that wet condi-tions could extend at least into early March.



Increased streamflows in February helped to halt a developing drought threat along much of the East Coast and inland to northern Alabama. All but two of the 31 key index gaging stations in New York, New Jersey, sylvania, Maryland, Virginia, West Viiginia, Kentucky and Tennessee reported average to above-average streamflow during February. In contrast, during January each of these states had reported well-below average

streamflow at one or more index stations. Working in cooperation with federal, state and local officials, USGS hydrologists routine collect data on streamflow and ground-water conditions at more than 45,000 sites across the country. Highlights of February water conditions:

Big Five: Individual February flows-Mississippi River near Vicksburg, Miss., 494 bgd, 18% above average, but down 27% from Jan-uary's flood volume; St. Lawrence River near Massena, N.Y., 158 bgd, 5% above average and 6% above the January average flow; Co-lumbia River at The Dalles, Ore., 89 bgd, 35% above average and 8% above last month's flow; Ohio River at Louisville, Ky., 88 bgd, 22% below average, but up 44% from the January flow; and the Missouri River at Hermann, Mo., 60 bgd, 87% above average and 17% above last month.

Ground-water conditions: Ground-water

conditions varied across the country. The water level in key index wells in Kentucky, Nebraska, North Dakota and Nevada set new record highs for February. All four of the key index wells in North Carolina reported water levels that were one to four feet above the long-term average. Ground-water conditions in Delaware and Maryland remained well below average, with one key index well near Fairland, Maryland, reporting the 29th consecutive month of below-average water levels. The water level in a key index well near El Paso, Texas, fell to 78 m below the land surface, the lowest level reported at this well in 18 years of record.

#### **Detecting Electron** Precipitation

Preliminary results were recently reported from the Navy's Stimulated Emission of Energetic Particles (SEEP) satellite regarding detection of stimulated magnetospheric electron precipitation from ground based Navy VI.F transmitters (Eos. January 18, 1983). The results, first released at the AGU Fall Meeting, were obtained on passes during mid-August 1982, using coded transmitter pulses with a duty cycle of 3 s 'on,' 2 s 'off.'

We note here that a similar experiment was nducted by the National Aeronautics and Space Administration (NASA) using low-cost recoverable rocket payloads from Wallops Island, Virginia, during late June and early July 1982. These flights also used the Navy VLF transmitter (NSS) at Annapolis, Maryland, with the same coding as that used for the later SEEP experiment. Participants in the NASA experiment included scientists from Goddard Space Flight Center, Denver University, and Cornell University. The results of this experiment, also reported at the AGU Fall Meeting, show evidence for pulsed electron precipitation patterns with the same period as the transmitted VLF pulses. These results were accomplished by sensing the bremsstrahlung X rays produced when the electrons reenter the atmosphere. A zenithviewing, wide angle X ray detector was stabilized with a slow descent aboard a parachutehung payload; this permitted a statistical build-up of the X ray signals over thirty 5-s cycles, a benefit not afforded by a fast moving satellite. Cross correlation analyses of the X ray data with the transmitted signal clearly demonstrated the existence of this effect at a detectable level under nighttime conditions. The SEEP results, which measured the precipitating electrons in situ, are consistent with

these earlier NASA findings. The NASA result was up role of both anthropogenic and natural VLF sources as a magnetospheric stimulant. In particular, lightning appears to be a reasonable candidate for producing a continuous stream of magnetospheric electron drizzle, since approximately 2000 thunderstorms occur over the globe at any instant. Comparisons of the VLF energy from the VLF transmitter to that from lightning were made with onboard VLF receivers and show the lightning source to be larger on average by a factor of 10. More details on the NASA results can be found in an upcoming issue of Science under the title 'Controlled Stimulation of Magnetospheric Electrons by Radio Waves: Experimental Model for Lightning Effects' by R. A. Goldberg et al.

This news item was submitted by R. E. Hartle of the NASA/Goddard Space Flight Center, Laboratory for Planetary Atmospheres, Greenbell, MD

## torum

#### Research Funds

Joseph Walder's rambling diatribe against accepting research funds from the Department of Detense (Em, December 28, 1982, p. 1346) deserves some rebutal In particular, I would like to respond to s question, 'Does acceptance of financial upport from military sources make indiiduals and institutions dependent clients of the Pentagon?' The answer is: of course not, unless they want to be.

As an Air Force scientist and research ontract manager. I can state categorical that we put no pressure upon our contrac tors to become our 'chents.' Indeed, we aution them not to become too dependent upon Air Force funds for continue funding of research projects, due to yearto-year changes in programs of interest of the Air Force and availability of funds. The only 'control' that we exert over contractors is their voluntary agreement to perform the work that they have unlated lly proposed to do by submitting an un solicited proposal to us. These proposal are reviewed in-house, and funding is de termined purely on relevance, availability of funds, and our estimate of the quality of the proposed research (investigators, facilities, etc.).

Thus, funding of a research project b the Air Force, at least in nonsensitive ar cas, is more volatile and has only slightly more stringent requirements (e.g., we usu ally require one scientific report or jour nal paper per year) than does funding b the National Science Foundation. This hardly makes our contractors our 'client' which I am sure can be attested to by the many historate research scientists who have been funded by us over the years.

> Richard C. Ahro Air Force Geophysics Laborato Sunspot. New Mexico 8834

#### Another AGU Index

I note that Juan G. Roederer has proosed an index of AGU affiliation name ]GR (Eas, October 19, 1982, p. 817). Acording to this index. Alaska is the mon-AGU-involved state in the Union. I praise his customary modesty in disclaiming any connection between his initials and the name of the index. I think it only fitting that the index be applied on a worldwide basis since AGU in many ways transcends national boundaries, as indeed its subject

I propose that the worldwide index, applied to each country as the JGR index 6 applied to the states, should be named at er either a well-known magnetic index or ne Atmospheric Explorer spacecraft, ic. t should be known as the AE index. Lof rourse, canulate Dr. Roederer in disclaim ing any connection with my initials.

A tour around this part of the world with the AE index shows that Israel has an index of 10 compared with  $2 imes 10^{\circ}$ for Egypt and even smaller values for <sup>oth</sup> er countries in the region. India has ap-proximately the same number of AGU members as Israel with a population mon than two orders of magnitude greater. Thus, it appears that Israel is the most MGU-oriented country in Asia.

> Abaron Eviatar Tel Aviv University Tel Aviv, Israel

#### **Education Bill Passes**

On March 2 the U.S. House of Represent tives passed a bill authorizing \$425 million for science and mathematics education in fa cal 1984; the authorization is \$350 million more than President Ronald Reagan requested in his budget proposal (Eos, February 15.

H.R. 1310 allocates \$295 million to the Pe partment of Education not only to improve precollege instruction in science and mail, but to beef up foreign language training to ald in improving international communication among scientists. The bill also allors is million to the bill also allors is million to the bill also allors is the bill also allors. million to the National Science Foundation for a variety of programs, the lion's shart of which aims to upgrade research equipment colleges and universities. It is hoped that it dustry will match the \$100 million targets.

for this program. Although the Senate has yet to draw up companion bill, hearings were held by the Education, Arts, and Humanities subcompile tee of the Senate Labor and Human Research sources committee on March 8 and 9 on the the Education Security Act and related so tence and mathematics legislation. Follow in hearings are arrived as the security Act and related so the security Act and related so the security Act and related so the security and related so the s hearings are scheduled for April 7.—BTR

# **Books**

#### Introduction to Tides: The Tides of the Waters of New England and New York

A. C. Redfield, Marine Science International, Woods Hole, Mass., 108 pp., 1980.

Reviewed by Malcolm J. Bowman

This interesting little book is not really about what its main title suggests, an introductory text on tides for oceanography students. Its subtitle gives more of a clue to its contents and intended readership. The author immediately points out in the preface that this book is written for the many intelligent people who work or play along the coast between Sandy Hook and the Bay of Fundy.'

In addition to discussing elementary tidal theory, the book describes in some detail the author's systematic analysis of coastal tides and currents in the New England and New York region. His analysis fits the solution of the telegrapher's equation to Tide Table predictions of tidal elevations and times of high water and slack current. In this way, Redfield separates the observed M2 tides in various straits, embayments, hydraulic channels, and estuaries into damped, progressive waves travelling in opposite directions. These waves arise through reflection of the primary wave at the head of an embayment or estuary, or through two primary waves entering a tidal strait or hydraulic channel from both ends.

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Cover. Roll clouds spell trouble; they are often on the leading edge of heavy thun-derstorms that can produce hail, high winds, and heavy rain. The clouds, such as those over Miles City, Mont., pictured on the cover, are but one of the many phenomena portending geographically limited but severe stormscale weather. A call for action has been issued for a National STORM (Stormscale Operational and Research Meteorology) Program to enable meteorologists to observe and pre-dict such small-scale weather and to apply the improved predictions to protecting the public, the national economy, and meeting defense requirements. Proponents of the 10-year, \$1-billion program say it could save 5% of the annual \$20 billion lost to severe weather. See related news story, this issue. (Photo courtesy of Phil Roskowski, National Center for Atmospheric Research/National Science Foundation.)

Using a nomographic method, the technique produces curves of mean tidal range and times of high tide and slack water along the waterway for optimum estimates of the damping and reflection coefficients. These predictions, well known from Redfield's pioneering use of the method in his series of papers during the 1950's, are quite good for the tidal height and interval but not for slack water. This is to be expected, since the equations were originally developed for use in a rectangular uniform channel, and take no account of the effects of weather, overtide generation, the earth's rotation, bathymetry, and

varying cross sections of the waterways stud-

Unfortunately, most of the intended readers will probably not understand the summary of the theory as given in chapter 3, nor, therefore, its application; they will have to read the original papers for that. Even then only those familiar with elementary trigonometry and calculus will make much sense of it. (Coastal engineers have made much use of the method and a particularly good discussion is given in A. T. Ippen and D. R. F. Harleman. Tidal dynamics in estuaries, in Estuary and Coastline Hydrodynamics, edited by A. T. Ippen, McGraw-Hill, New York, 1966.)

Another criticism one could make of the text is that no mention is made of the whole realm of numerical tidal modeling. Numerical simulations are now sufficiently easy to apply and accurate to be of major importanc in the production of tidal atlases of semi-enclosed seas and navigable waterways. In spite of this, and allowing for the limitations inherent in the fitting of linear, one-dimensional. damped wave theory to coastal tides, the book is immensely readable and will find its way to the bookshelves of mariners, amateur scientists, and oceanographers all along the northeastern seaboard. Professional coastal oceanographers will also find it a quick source of useful facts and figures.

One thing Alfred Redfield does not disclose is the secret of his longevity. How a man had the energy and lucidity to produce such an interesting book as he approached his ninetieth birthday is a source of wonder to me. Perhaps the characteristics cited by the late Bostwick H. Ketchum in his foreword Chis interest in natural phenomena and his curiosity about them have been undiminished by passing years') have had a lot to do with it

Malcolm J. Rowman is with the Marine Sciences Research Center, State University of New York at

#### Igneous Rocks of the British Isles

D. S. Sutherland (Ed.), Wiley-Interscience, New York, xv + 645 pp., 1982.

Reviewed by K. L. Currie

Much of the foundation of petrology was laid on the igneous rocks of the British Isles—one need only recall the Tertiary igneous rocks of northern Scotland. However, the relations between various occurrences of these igneous rocks (and in some cases even their locations) have remained obscure for many of us familiar with the British Isles only through the voluminous literature. This weighty and densely written tome will serve as a most useful guide and reference for all those interested in British igneous rocks. The volume specifically aims to continue that grand classic of observational geology, Ancient Volcanoes of Great Britain by Archibald Geikie. It does not achieve quite that level but will surely remain an indispensable general reference for many years if only because of its extensive bibliography.

appendices. The rocks have been divided acding to age and type, namely the Precambrian, Lower Paleozoic volcanic rocks, Caledonian intrusive rocks, Devonian and Carboniferous volcanism, Hercynian intrusive rocks, Late Paleozoic and Mesozoic igneous activity, and the British Tertiary province petrographic, chemical, and isotopic details are relegated to three appendices. Each part is further broken down into a general introduction followed by several articles on particular occurrences or aspects of the igneous The usefulness of reference books of this kind depends on the quality of the introduc-

The volume includes contributions by 37

coauthors divided into seven parts and three

tory chapters and on the completeness of the indices. In both respects this volume rates high. The indices are exceptionally good, and the introductory chapters do a good job at placing the later material in context, although was rather overwhelmed by the profusion of place names. This generally laudatory comment does not imply that anyone can readily sit down and get an overall picture of the igneous history of the British Isles from this book. In the first place there are certain difficulties of organization, perhaps inevita-ble. Only peripherally and in passing is it noted that the part on Devonian and Carboniferous volcanism treats rocks contemporary with, and possibly comagniatic with, Caledo-nian and Hercynian intrusives. The quality of the writing varies from pedestrian to extremely dense. I found it heavy going because of the wealth of references and the attempt to get the maximum number of facts into the minimum amount of space. Still, the facts are there if the reader will dig for them. A wealth of small locality maps greatly aid the visualization. Occasionally these maps cannot be easily referred to larger scale maps, but in general the 'hierarchical' organization is good. The number of photos is limited, but their quality is excellent. The various articles treat mainly of descrip-

tive aspects of the rocks with sketches and lo calities. Some authors treat bulk chemical data by presenting various diagrams, but there is little treatment of mineral chemistry or of specialized chemical data such as rare earths, although such details can in general be traced in the very extensive bibliography Treatment of petrological problems is sketchy and superficial. Some sections are quite repetitive, particularly the one on the Tertiary. where Mull and Arran are treated in three successive articles. The distribution of space may seem somewhat idiosyncratic also. The Tertiary rocks receive the most space, 193 pages, which is not unreasonable, but 34 pages for the celebrated Hercynian granites of Cornwall, when compared with 68 pages for Carboniferous-Permian volcanism and 88 for lower Palcozoic volcanism, seems somewhat unbalanced. The selection of clata for the appendices exhibits some peculiarities. The appendix on petrography starts off with a modest encomium to the Streckeisen classification and then reverts to such terminological monstrosities as 'marscoite,' 'tregelvanite and 'rockallite.' According to the chemical data, trace element analyses are rare or absent for the Tertiary province and for the Caledonian intrusives.

Despite these reservations, the book clearly succeeds in its object of giving condensed de scriptions of the significant localities of igneous rocks in the British Isles. The question remains whether there is a clientele for such a large, expensive, and specialized book. It cannot be read for sheer pleasure, unlike its distinguished predecessor, Ancient Volcanoes of Great Britain. The quantity and level of information are insufficient for specialists wishing to study a particular complex either in the field or in the literature, although it will unGeophysical Monograph 22 Derivation,

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doubtedly be of great use as a guide and entry to the literature. The obvious place for this book is therefore on the reference shelf of libraries, where it will doubtless remain the standard work on the subject for many years. Few individuals will be interested in this book for their private library.

K. L. Currie is with the Geological Survey of Canada, Ottawa, Ontario.

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Further particulars may be oblained from the Secretary of the University Court. (Room 18). University of Glasgow, Glasgow, G12 8QQ, with whom applications (8 copies: 1 copy if the case of oversens applicants), giving the names and addresses of three refereos, should be lodged on or before 6th May, 1983, Late applications from overseas will be considered; telegram in the first instance if necessary.

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# **Meetings**

#### **Announcements**

#### Ocean Data Presented

A large portion of the unpublished marine geological and geophysical data gathered in 1982 in the Alcutian-Bering Sea and the southwestern Pacific by the U.S. Geological Survey (USGS) research vessel RV S. P. Lee will be made available at a one-day 'show-ntell' at the USGS in Menlo Park, Calif., on April 5, 1983. The data was collected as part of the Circum-Pacific Project, a cooperative effort involving about 25 countries that began last May. The project includes studies of active volcanoes along the Pacific 'ring of fire' and exploration for new oil, gas, and mineral

Among the data to be displayed is that gathered from petroleum prospective areas near Tonga, Vanuatu (New Hebrides), and the Solomon Islands.

Michel T. Halbouty, chairman of the Circum-Pacific Council for Energy and Mineral Resources, will open the symposium with a keynote address on the national importance of scientific investigations of the Circum-Pacific rim. His address will be followed by a series of brief papers describing the purpose and nature of the work being exhibited, and some of the more important initial results.

Although no registration is required, those interested in attending should call Florence L. Wong (telephone: 415-856-7042) at the USGS in Menlo Park, Calif. General informaAhoy! Sall Back into Baltimore

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Airline, registration, and housing material was Published in Eos, February 8.

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tion about directions, local travel, and lodging | circum-Pacific section of the American Assomay be obtained from Fran Moyer (telephone: 415-856-7143).

The 'show-n-tell,' the first of several symposia and workshops to be sponsored by the ciation of Petroleum Geologists (AAPG), also is sponsored by the Pacific marine geology branch of the USGS.

Mourice Ewing Series Volume 4: Earthquake Prediction An Inter**a**national Review Paul G. Alchards During the past 5 years exciting new evidence on the earthquakes has come from geologic studies of fault zones, particularly trenching and the dating of offset geologic units. One of the goals of the Third Ewing major events in Chine, Japan, Maxico, the U.S.S.R. and the U.S.A. are included.

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IMP APROXOEC DISSOCIATION OF WATER VAPOUR BY SOLAR II LYMM a RADIATION

B. R. Levis, I. M. Vardavas and J. H. Carver [Research School of Physical Sciences, The Australian National University, Camborra, ACT, 2600, Australian The photoabsorption cross sections of melecular cryston and water vapour have been seasured as a function of temperature at 0.1 A intervals between 1214 and 1219 A. Over the width of the solar Lyman a line there is no fine structure apparant in the cross sections which were measured with 0.08 A resolution. A large wavelength and temperature dependence is seen in the molecular oxygen cross sections but the variations are such smaller in the case of water vapour. The Research cross sections are used in calculations of the rate of photodissociation of atmospheric water vapour by solar Lyman a radiation, taking full account of both the temperature and wavelength dependence. It is found that the photodissociation rates say be accurately reproduced at slittudes above those where Lyman a consess to desinate the dissociation by using solucular oxygen and water vapour ercoss sections corresponding to fixed temperatures may 200 K. Analytical models for these cross sections are presented for use in photochemical calculations. (Photoabsorption, photodissociation rates), J. Geophys. Res., Blue, Paper 1A0258

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COMPARISON WITH MARROW BAND MODELS AND WITH LABORAIDRY DATA

J. T. Kiehl (National Center for Atmospheric Research, Boulder, Colorado 80307) and V. Remanathan
Absorptances for the 15 µm band system of CO<sub>2</sub> are actualized from three models: the Goody model, the Malkaus model and a wide band formulation. The wide hand formulation used in this study applicitly accounts for hot and isotopic bands of CO<sub>2</sub>. Comparison is made between these calculated sheerptances and measured sheerptances. The hand models are in good agreement with the esseured absorptances. The sensitivity of thase models to increased CO<sub>2</sub> is investigated by intercomparing flux and heating rate changes computed by the three models. It is concluded that little difference exists between the narrow hand and wide hand sheerptances models, provised the wide band models ecocount explicitly for the verious hot and isotopic bands of CO<sub>2</sub>. We show that significant errors result if the Goody or National Comparison of CO<sub>2</sub> that is applied to spectral intervals larger than sodel is applied to spectral intervals larger than sodel is applied to spectral intervals larger than social is applied to spectral intervals larger than social is applied to spectral resolution (> 10 cm<sup>-1</sup>) may be subject to errors (in CO<sub>2</sub> fluxes and heating rates) larger than 10s, we also show the differences between the nerrow and the wide band model treatment of H<sub>2</sub>O-CO<sub>2</sub> overlap in 15 m region, The H<sub>2</sub>O continuous absorption in the 15 m region alters significantly the vertical distribution of CO<sub>2</sub> heating in the lower troppeaphere.

9430 Compaction

simultaneously measure ozone density, temperature, and solar ultraviolet flux. Results from six months of observations show that ozone density in the mesosphere changes from day-to-day and with the seasons and that the principal cause of these changes is the variation in atmospheric temperature. The dependence between ozone density and temperature is inverse, with a decrease in temperature producing an increase in ozone density. This dependence is observable in the seasonal patterns and also in orbit-to-orbit observations during dramatic atmosphere changes such as stratospheric warmings.

0430 Composition OZONE DENSITY DISTRIBUTION IN THE MESOSPHERE (50-90 KM) MEASURED BY THE SNE LIMB SCANNING NEAR INFRARED

THE MEASURED BY THE SRE LIMB SCAMMING MEAR (MFRARED SPECIFICANTER R.J. Thomas (Laboratory for Atmospheric and Space Physics and Department of Astra-Geophsydes, University of Colorade, Boulder, CO 80309) C.A. Barth, G.J. Rottman, B.M. Rusch, G.H. Numat, G.M. Lawrence, F.M. Sanders, G.E. Thomas and L.E. Clamans.

The ozona densities between 50 and 90 km are deduced from 1.27 µm airglow measured on the Solar Mesosphere Explorer satellite. The derived densities agree well with those made simultaneously from 3Mt by the ultraviolet spectrometer. The data set extends from pole to pole at about 3 pm, for most suntil latitudes. At low altitudes, in the mesosphere, there are larger variations in ozone density in the winter latitudes than in the summer. Above the meso-pouse the day-to-day variation in ozone density is a factor of two at most latitudes and times.

Geophys. Rem. Lott., Paper 3L0301 Geophys. Res. Lott., Paper 3L0301

O430 Composition
MESOPSHERIC OZONE DEPLETION DURING THE SOLAR PROTON
EVENT OF JULY 13, 1982 PART I NEASUREMENT
R.J. Thomas (Laboratory for Atmospheric and Space
Physics and Bepartment of Attro-Geophysics, University
of Coloreda, Boulder, CO 80309) C.A. Barth, G.J.
Rottman, B.W. Rusch, G.H. Mount, G.M. Layrance, R.V.
Sanders, G.E. Thomas, and L.E. Claeens.

The near infrared spactrometer and the ultraviolet
spectrometer on the Solar Mesosphere Explorer (SME)
observed the uzone density as a function of latitude
and altitude during the solar praton event of July 13,
1982. Airgiow at 1.27 µm was observed at the earth's
limb. The altitude profiles of the emission were
inverted providing ocone densities. The exone
densities observed showed a clear decrease during the
evant. The maximum deplation seen was 70%. The
decrease was observed in the northern high latitudes
at mesospheric altitudes. The decrease was very short
lived, lating less than a day.
Geophys. Res., Lett., Paper 310325

red and hear-in nyiro as well as 2 aby - local mean-sions, while in mid-day cusp surers the ratio is greater than 10%. These observations point to electron inpace on N (rather than on No) as the asis source of some of the mid-day sureral M line salesions. To pro-duce the measured lavel of N 1045-51 and 5979-824 emissions, by cusp electrons impacting on N, required

0430 Composition (atomic or molecular)
TEMPERATURE MEASUREMENTS IN THE EARTH'S STRATOSPHERE
USING A LIMB SCANNING VISIBLE LIGHT SPECTROMETER
D.M. Rusch (Laboratory for Atmospheric and Space
Physics, University of Colorado, Boulder, CD 80309).
G.H. Mount, J.M. Zawadny, C.A. Barth, G.J. Rottman,
R.J. Thomas, G.E. Thomas, R.W. Sanders, and G.M.

R.J. Thomas, G.E. Thomas, R.M. Sanders, and G.M. Lawrance.
The temperature of the aerth's atmosphere between 40 and 60 km is inferred from measurements of Rayleigh scattered sunlight by a visible-light spectrometer on the Solar Mesosphere Explorer spacecraft. The HMS deviation of the aetallite measurements for From conventional rocket measurements is 5% above 45 km and 2-3% below 45 km. The satellite data are compared to model temperatures for March, 1982.

Geophys. Ses. Lett., Paper 3L0409

Geophys. Res. Lett., Paper 310-009

O430 domposition (atomic or moldewime)
COMPARISON OF MESOSPHERIC OXOME ADMONANCES MEASURED BY
THE SOLAR MESOSPHERE EXPLORER AND MODEL CALCHLATIONS
S. Solomon, (Aeronomy Laboratory, MOALVEL, Boulder,
Colorado 60303). D. M. Resch, R.J. Thomas, R.S.
Ectman, (Laboratory for Atmossheric and Space Physics,
University of Colorado, Boulder, CO 80309).
Ozone observations in the mesosphere obtained by the
near infrared and ultraviolet spactrometers ombard
the Solar Mesosphere Explorer (SME) satellite are
Compared to two dimensional model calculations for the
month of January. In general, the model calculated
abundances are somewhat smaller than those Measured,
but subtibit similar trends with respect to altitude
and latitude. The possible caumes of discrepancies
include the mesospheric Ryo content and photochemical
reaction rates, particularly the rate of Og
photolysis. RESOLTS
C.A. Barth (Laboratory for Atmospheric and Space)
Physics and Department of Astro-Baophysics, University
of Colorado, Boulder, CO 80309) D.M. Rusch, R.J.
Thomas, G.M. Hount, E.J. Rottman, G.E. Thomas, R.M.
Sanders and G.M. Lawrence.
Instruments on the Soler Mesosphera Explorer photolysis. Res. Lett., Paper 310395

MESOSPHERIC OZONE DEPLETION DURING THE SOLAR PROTON EVENT OF JULY 13, 1982 PART II. COMPARISON SETWEN THEORY AND MEASUREMENTS.

S. Solomon, I Aeronomy Laboratory, NOAA/ERL, Boulder, Colorado, 803031, G.C. Reid. D.W. Pusch, R.J. Thomas, (Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado 803091. The solar proton event of July 13, 1982 was the largest to date in the current solar cycle. Proton Fluxes observed by the NOAA-6 satellite have been used to calculate ionization rates during the ovent, which have been found to be almost as large as those of the August, 1972 event hear 70 km, but such smaller at lower altitudes. This ionization leads to the production of odd hydrogen radicals (McDHHag) which catalytically destroy odd oxygen in the masosphere and stratosphere. A one-dimensional time-dependent model has been used to calculate the percentage change in come resulting from this event. The calculated oxome depletion is compared to that observed by the Solar Caulater Later (1971) and 1979. Caulater Later (1971) and 1979.

Gaophys. Res. Lett., Paper 310396

0430 Composition

REASUREMENTS OF Mg. IN THE EARTH'S STRATOSPHERE USING

A LIME SCANNING VISIBLE LIGHT SPECTROMETER

G.H. Mount (Laboratory for Atmospheric and Space
Physics and Bapartment of Astro-Goophysics, University
of Colorado, Boulder, CO 803099 D.W. Susch, J.T.
Zawodny, C.A. Barth, G.J. Rottman, R.J. Thomas, E.E.
Thomas, R.W. Sanders, S.M. Lawrence, J.F. Moxon
(Aeronomy Laboratory, MOAJFERL),
NO, densities determined from the 11mb scanning
visible light spectrometer on board the Solar
Nessophere Explorer spacecraft are reported for winter
1981/82 in the altitude region 28-40 km. The
observational tachnique utilizes the photoabsorption
by NO, of Rayleigh scattered sunlight in the 440mm
spectral region. The NG, density varies from pole to
pole and shows large variations at high morthern
latitudes during the winter months which are related
to both the temperature and flow of air near 30 km.
Geophys. Res. Lett., Paper 310028

Physics of the Solid Earth Volume 18, Number 5

OLSO Composition (atomic of molecularity of with the street of the object of the street of the stree STRAT.SERRIC CO-TO OBSERVATIONS STRATARDON STRAIN, AT 1893.

R. L. Ma conte (PEL Attumpments station, PSIR, Lauler, Mago, Rea Zealant), and P. V. Johnston.

A least squares data reduction technique for extracting strat sphoric ocone at minuscen con currently with Boy absolutions are described. The sphares of the station is extracted to the sphares of the sphares at the second per from preferency by in the wavelength of one sphares one. Laures of error are allocated in the operant so, and, of or, no retrievals is quentified in terms of the gradual error accepted. Possite obstated from the classification of the property of the period of the control of the sphares of error are strained for the period December 1982 to April 1982, and compared with Euton total some values, the technique may find use because both Boy and O3 amounts are obtained characterously from the case apapted volume. Thus there is the potential for providing observational evidence for modellad

Geophys. Res. Lett., Paper 310300

0460 Tides, waves and winds POKER PLAT HST RADAR HEASUREMENT OF WINDS AND WIND VARIABILITY IN THE MESOSPHERE, STRATOSPHERE AND PROPERTY.

VARIABILITY IN THE MESOSPHERE, STRAIDSPHERE AND TRUPOSPHERE Bao B. Balsley (National Oceanic & Atmospheric Admin., Aerdomy Leboracory, Soudier, CO 60303) The capability of the MST tachhilque for measuring winds and wind variability in the measurphere, atratowinds and wind variability in the massaphers, etrato-sphers and troposphers is demonstrated using recent results obtained from the MST rader at Poker Flat, Alatha. Hescopheric results include mean flow, tidal notions and shorter term fluctuations. Stratospheric-tropospheric regules include, in addition, high-frequency (> 13 ) www-like fluctuations observed in the vertical wind field. Red. Sci., Paper 180378

Аранович З. П., Ярошевич М. И. Вопросы стандартивации частотных харак-и магнитного диполей в двухслойной среде с непроводищим перхими слоем Захаров Е. В., Несмеянова Н. И. Чясленное исслодование влияния радиально

пооднородной зоны проникновения на результаты электромагилиного ка-

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atmospheric pressure

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#### SCIENTIFIC COMMUNICATIONS

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#### CHRONICLE

Berdichevsky M. N., Bezruk I. A., Vanyan L. L., Volkov Yu. M., Dmitriyev V. I., Zhdanov M. S. The 6th All-Union Symposium on geoelectrical methods

# **AGU Panel Meets**

On Career Topics Graduate students and their career opportunities in ocean and earth sciences were the focus of the Education and Human Resources (E & HR) Committee meeting held at the 1982 AGU Fall Meeting in San Francisco. A standing committee of AGU, the E & HR committee is responsible for matters concerning education in earth, ocean, and planetary sciences from precollege through graduate programs, including career guidance, academic preparation, student recruitment, and

manpower supply and demand.

At the meeting a draft of the AGU-sponsored Gariers in Oceanography booklet by committee chairman G. Hollster was thoroughly discussed and a new draft will emerge soon for final approval. The booklet is designed to complement the Careers in Geophysics booklet recently published by AGU; the booklets contain information about planning a career, job

opportunities, educational requirements, and a synopsis of where the prospective student might apply.

Among other topics discussed were the following items: (1) AGU-sponsored lectureships for graduate student recruiting in oceanography; with no volunteers and no money for such lectureships, the booklet and individual efforts will have to suffice as recruiting devices; (2) AGU women's sessions sponsored by this committee will drop special reference to women, but the panel at the 1983 AGU Spring Meeting (Louise Levien, chair) will compare the advantages and drawbacks of careers in academia, industry, government or consulting; (3) the E & HR Committee will be developing a membership-wide questionnaire in order to improve and perhaps increase the committee's service to AGU. The new edition of Geophysics - The Earth in Space, AGU's career booklet for high school

space, AGUs career pooriet for nigh school students, is now available. The material has been updated and the format changed and expanded by use of pictures. In addition to the revision of this booklet, AGU has within

the last year produced Careers in Geophysics, which is aimed at undergraduate and graduate-level college students, and the above-mentioned draft of an additional booklet on ca-reers in oceanography. Individual copies of both Geophysics—The Earth in Space and Ca-reers in Geophysics are available free of charge to students. In addition, larger supplies are available to professors and guidance counselors for their students upon specific request. At the Fall Meeting our committee also

sponsored a panel discussion (chaired by C. Sancetta) on Doubts and Discouragements: Beginning a Career.' About 50 people attended and a report of the session may be found in the Editorial section of this issue of Eas. Charles Hollister Woods Hole Oceanographic Institution Chairman, AGU Education and

Human Resources Committee

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#### Electromagnetics

OZIO Elactromagnetic Theory

(AVE PROPACATION OF A STRIP GRATHS OVER AN
IMPEDANCE PLAYE. SCLUPION BY REDUCTION TO A
HOUSTED REMANN-HILBERT PROBLEM.

(A.K. Barbosa (Canto de Anniles e Frocassmento
de Sinaly, Cospleno Interdisciplinar, Institute
Superior Ticalco, Av. Rovisce Psis, 1096 Lisbos
Codex, Portugal), A.P. dos Santos and J.Figuader
The TW electromagnetic wave propagation slong
a strip grating above an impudance plane is
atudied. The problem is formulated in tarms of a
modifical dimensu-Hilbert problem. The modal
equation of the structure is derived and solved
numerically. Surface wave and leaky were undea
are identified. Phase velocity and attempted
constant of the dominant leaky were modes are
presented and their dependence on frequency and
geometrical parameters is discussed. The
possibility of application of this structure to
the design of a leaky-wave musoms is suggested.
(atrip grating, electromagnetic wave propagation,
lasky waves. Riamon-Hilbert problem).

Rad. Sci., Paper 350407

RAI. Sci., Paper 150407

G770 Radio Ocsanography
FRANKTRIE DEPENDENCE OF OCEAN MAYE-RADAR MODULATION
TRANSFER FUNCTIONS
W. J. Plant (Environmental Sciences Division, Saval
Besearch Laboratory, Vashington, EC 20175), W. C.
Feller and A. Cross
During the Marina Resolve Sancing experiment of 1978
(MANISH 79), we employed attroceave techniques at Xand L-band to detaraine the dependence of ocean-wave
radar modulation transfer functions (MEFR) on various
environmentals and radar parameters. In this paper,
we present these MITS along with coherence functions
between the AM and FM parts of the beckenattered
statemant of these parameters. In addition to confirming many of the properties of transfer functions
reported by previous authors, this work indicates
that MTPs decrease with increasing angle between
wave propagation and antenna-look directions but
are essentially independant of small changes in airsea temperature difference. Coherent functions are
much smaller when the entonnas are pointed perpandicular to long serves, honever, N-band transfer
functions measured with horizontally polarisate before
wave radiation are found to have larger sequitudes
than those obtained windy cartical polarisation,
Under conditions encountered in this experiment,
transfer functions are independent of long-wave
applitude when waves and antennas are aligned.
Coherence functions, rowever depend attempty
on larg-wave amplitude, we show that this
dependence implies that in addition to being
actulated by long waves, short waves smalltides
if there is no parts to environmental factors
uncolated to long waves. Spectrad dentities
of these fluctuations are shown to be comparable
to those of redutations are shown to be comparable
to those of redutations are shown to be comparable
to those of regulations are shown to be comparable

OFFI RENOTE SCHOOLS AND ALL SEASAT AND SER-A IMALISES OF CORPORTSIFED LANDSAT, SEASAT AND SER-A IMAGES OF VAPIET TERRAIN TYPES. Ph. Robillard and D. Evans [Jet Propulsion Leboratory, laifforming insertuals of Technology, RS 183-701, 4800 Och Group Dr., Passadons, CA 91109). Purifice of Those data (RIF-A, Besset SAR and Landsat Misi over areas in northern Algeria and eastern Usah have been corogistered in order to assess the complementary effects of the orbital sensors for geologic rapping in two very different terrains. This first attempt at replaceting, such a data are whose these reader bases after information provided by the SIR-A image interest settlement classification accuracy of several geologic units over the leadest image alone, and over combined teachers, item. See 1911. Paper 110303

#### **Exploration Geophysics**

OPIO Computer Applications
HINGSECAL AMALYSIS OF THE 45-DEGREE FIRITE-DIFFERENCE
RECATION FOR MEGRATION
HEATY Brysh (Teledyne Exploration Co., P.O. Box 16269,
HOUSTOR, IX 1/018)

iduation, II 1/018)

Highation is now most commonly performed by means of a finite-difference colution of the wave equation in the spece-time domain (although alternative approaches such as f-k, Kirchhoff, finite-difference in the apace-frequency domain have atrong adherence. Classibout's derivation of the 15-dagree peraxial ray equation and its iteration to the 43-dagree equation are well documented. On the other hand, the transcription of the differential squation to a finite-difference scheme has accraced with practical computing

#### Physics of the Solid Earth Volume 18, Number 6

The 90th anniversary of O. Yu. Schmidt . The 90th anniversary of O. Yu. Schmidt
Salronov V. S. The theory of the Earth's origin — the state of the art
Levin B. Yu. The cosmological significance of asteroids, comets and meteoritic
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the Earth the Earth Kuskey O. L., Khitarov N. I. Geochemical aspects of the early evolution of the Earth
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of the Almosphere
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of Formation of Very, Close Pack Ice Zones

CRITICS AND BIBLIOGRAPHY Khrgian A, Kh. Book Roview: Karo P B. P. Academician B. B. Colitsyn and

emperience and is only mentioned piecement (when at all) in the literature. The full expression is reviewed here, as used in a typical production code. A numerical stability analysis of the won Mausann type is applied to the complete finite-difference squarion. It proves that the computer significations stable, at least for the values of the computational prematers in normal use (the sensitivity to the values of those persenter is illustrated.) Thus, may perceived notifices of migrated sections cannot be blassed on computational precision. The other country are employed and the medaling.

GEOFERMEIGH, Vol. 48, NO. 5

OSIO Computer applications
DIGITAL FILIZERO WITH THE EXCESS MARKET HORK
See STJO Refeate methods
L. S. Lines (Amone Production Company, F.O. Box 591,
Tules, Ox 76102) S. Treites
The Reckus-Gilbert inverse sathod relates model
antimates to setual earth models by use of a resolving
kernal. This inversion can in turn be related to
various digital filter designs. If the second meant
nors is used to define the resolving kernel, two types
of filters are produced by as eigenvector decomposition
of a time-weighted autocorrelation matrix. The
eigenvector corresponding to the largest eigenvalue of
this matrix is similar to the output energy filter,
while the eigenvector for the smallast eigenvalue
perform sors like a deconvolution filter. Synthetic
and real data exampler demonstrate has characteristics
of these filters and compare them to the familiar square
acra filters. Our empariments suggest that assend
moment norm filters offer no eignificant adventages
over their Euclidean norm valatives.

GEOPHYRICS, VOL. 48, NO. 5

DONOUTE ACCUSTON TAYES IN A STRAINTED OF UPCOING AND DONOUTE ACCUSTON TAYES IN A STRAINTED MIDIUM.

3. Seemen (Studes et Productions, Scalumberger, 26 Rue da la Cavas, 921au Clamare, France) L. Horovica Gen of the essential steps in the processing of a vertical estante profile is the separation of uppoing and devegoing signals. With this perspective in eled, he issue date to the sevential steps in the processing of a vertical estante profile is the separation of uppoing and devegoing signals. With this perspective in eled, he issue date to the sevent and a straint of these waves and a mathematically optimal "least-squares" technique for extracting than is derived. The method imposes practically no constraints on the spesiage between recording levels and allows almost perfect rejection of a coherent downgoing signal.

The exact formulation of the one-dimensional model requires that acoustic impedence information he included, but a reasonable and realistic approximation can maghet impedence. We derive frequency-wavenumber response plots for the two limiting cause of even and readomly spaced levels and compare these to the response of a "conventional" velocity filtering technique. By a careful study of wavilable logs, recording levels can be chosen to optimize goophone coupling rather than insisting on uniform spatial sampling. Data edition, normalisation, and true amplitude recovery (TAR) are required prior to application of the technique, The TAR entraction can be computed from sonic log data, which expression the safenic and logging worlds.

O930 Salasic machods
SKISHIG CHARCERISTICS OF A PREGAMBRIAN FLUTON AND LTS
ADJACET NOOMS
Z. Hajnal (Department of Geological Sciences,
University of Sackstchavan, Saskstcon, Saskstchovan,
Casada STN OND) N. B. Stauffer, H. 3. King, P. F.
Mallis, H. F. Wang, and L. H. A. Jones
Surface, borshole, and laboratory snowetic
measurements all confirm the emistence of a
near-surface low-welcety zone in metavolcatic,
measurements all confirm the emistence of a
near-surface low-welcety zone in metavolcatic,
measurements all confirm the existence of a
near-surface low-welcety zone in the plin Pion
region of Canada. This zone is taused by a high
frequency of open fractures and extends from the
aurface to depths of between 5 and 4 m., atthough
accasional open fractures without of a through
accasional open fractures without of a through
three is a linear dermace in sonic velocity with
increasing frequency of large fractures; the details,
however, vary for difference sites, depending upon
saveral geologic features including rock type and
aconfinears parcently. Laboratory sonic data indicate
very low microcrack demetities in the volcanic and
plumnic rocks.

Synthetic aciamograms derived from sonic log
information from the center of the granitic pluton have
been compared with a meathy multifold seismic profile.
This about that the near-surface low-welcelty sone
actendates meat of the high-fraquency seismic energy.
Rowaver, the remaining low-frequency portion of the
steel pluton.
GEOPENSICS, VDL, 48, NO. 3

GEOPHYSICS, VOL. 48, NO. 3

O930 Selsmic mathods

AMDMALOUS SETSHIC CHARACTER—BERING SMA SHELF

Roger D. Essmood (Exten Company, U.S.A., P.O. Box 4279,

Houston, TX 77081) John R. Gaithor

Seismic data collected within basins along the nuter

Baring Sas Shelf often schibit a distinct change in

seismic character between 1.0 and 2.0 sor two-way time,

This change appears on seismid sactions as a refidence

or as an increase or decrease in emplitude. The festure

is of regional extent.

This change in solsmic character is a manifostation

of what has been called in other basins a bottom

simulating refiseror (388), BBRs are reflectors that

(1) are sub-parallel with son floor topography, (2) are

distates, and (3) do not demonstrate all the

characteristics of a multiplo. Two sesses of BBRs are

Ronerally scaspted. One involves as ico-line mixiuter of

water and gas, called "gas hydrate," in which gas

molecules are trapped within a framework of water

molecules. The other cases involves the diagenetic

flatomacooms sediments.

BBRs ware penatrated at three locations in the Bering

Sas in water depths greater than 1800 m on leg 19 of

flatomacooms sediments.

PRIFABILE in estemic interpretation may be amountered

where this reflector intersects other reflectors at an

observable angle. The BBR may look like a sequence

boundary or a direct hydrocarhon indicator.

Racognition of the presence of this seismic character

change is of two-fold importance to exploratio

0910 Setamic methods
PREDICTIVE DECORPOLITION IN SMOT-RECEIVES SPACE
PREDICTIVE DECORPOLITION IN SMOT-RECEIVES SPACE PREDICTIVE DECONVOLUTION IN SHOT-BECKIVES SPACE
Lerry Morley (Geophysics Research and Development,
Arsaco, Dahran, Saudi Arabia) Jon Claerbout
Standard predictive multiple suppression techniques
in marine reflection selemology usually resort to
ona-dimensional assumptions about the anderlying earth
unded. The methods presented here use a multiple model
which assumes vartical incidence propagation in the
which assumes vartical incidence propagation in the
value layer, yet reluxes common assumptions of sero
offset and zero dip. Is particular, different
reflectivities and water depths are assumed at mource
and receiver locations.
One of these mathods, seafing reconsistent multiple
suppression, models such selemic trace as a convolution
geophose, midpoint, and offset responses. In the
additive model which one has solved by linear
responses are solved for auch frequency is
defined requency as a love of the selection
"about-receiver" space with frequency as the outer loop
of the slandid data set has been resolved in average and amounts.

"shor-receiver" space with frequency as the outer to a of the algorithm of the average and anomalous smalltude responses, the suitiple reverberation response is identified with the product of the anomalous shot and gasphose response. Since one can argue on physical grounds that the reverberation response for any particular trans cast be minimum phase, it suffices to solve only for amplitude responses and ignore phase contributions.

The methods are applied to a deep water marine see with extremely encouraging results.

GROPHYSICS, VDL, 48, NO. 3.

ROIDE ATTEMPATION BY PISCOREIS WHITEMING (VSW) BOISE ATTEMATION BY VISCORIE WHITEMING (VSU)

Can't Corum (Istanbul University, Vaspacetter Intended to Corum (Istanbul Intended Intended

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O930 Swissic methods
AUTOMATES ANALYSES OF MARINE REPRACTION DATA: A
COMPUTER ALGORITHM
C. Fakrick Ervin (Department of Geology, Morthern
Illimals University, Details, IL 60115) L. D. McGinnis,
R. M. Otis, and M. L. Mall
A computer algorithm is described that automates the
processing of refraction data acquired by conventional,
multichannel, seisaic reflection profiling, beginning
with the determination of the first survival times and
ending with a contoured velocity-dopth section. Traces
for several closely spaced shots are first summed to
supprass value. Each stacked trace is convulved with a
box operator to convert the first broak to a peak that
can be desceted by the computer. The algorithm
calculates intercept times using running averages of
velocity-depth profile, interpolated at constant
velocity intervals, is printed as a contoured
excess-acation. A protite evossing Georges Bank,
northweat Atlantia Ocean, is interprolated
GEOPHYSICS, VOL. 48, NO. 3 near imports source and/or receiver arrays of the burface were not used for the encording general to order to evoid a decrease in resolution could by the secondary of form of overlapping subsurface could have and the large-amplitude surface waste over attenuated by a process called Vibrosus whitehed that the secondary of the application of time-rappy supplies amplitude and the application of time-rappy supplies conventional sorbhold of anti-mails edigital gale exercity was found to be effective for this purpose. The scaling results in a signal-to-make ratio impresses equal to the gain expensed from crosscorrelates. The calling results in a signal-to-make ratio impresses equal to the gain expensed from crosscorrelates. The calling window length and the length of sums are the only parameters equival at define the signal-to-cale improvement for a given awapt-frequency band. A state acalling window and longer sweet length give better consequently the quantity of Atlantic Coastal his acalling window and longer sweet length give better crosscorrelation.

An income in the quality of Atlantic Coastal his data clearly showed that VSB processing resulted a high resultation on starked actions and safe it possible to map shallow have most reflections at 1 are, towed long faults with up to 10 m offset. Reflections from the sedimentary section above basent also became distinct.

GROPHYRICA, Vol. AR, Ro. 5

#### Geodesy and Gravity

1990 General or miscallaneous LAGGOTE AND RUMBERG STABLEST-LINE GRAVITY METS Lucius Lacosta (Laguata and Sumberg Gravity Metal Inc., 6600 N. Lamar, Augin, TX 78/22) inu., 4600 N. Lamer, Austin, TX 78/527
The Lateste and Rushing straight-line gravity and uses 6 and auspension in which the movable sized moves verificably in a straight line rather that is after of a circle (Lateste, 1973a). It was design primarily for shipbeard uperation to avoid affects be cross coupling between various ship sees larging thereby making it unnaceasary to correct far sufficient.

naw inserument. GEOPHYSIGS, VOL. 48, NG. 5

1990 General or miscellaneous FIELD TRIALS WITH THE LACOSTE AND ROBBERG STRAIGHT-LI

FIRED TRALE WITH THE LACOSTE AND ROMBERS STRAIGHT-HIS FIRED TRALES WITH THE LACOSTE AND ROMBERS STRAIGHT-HIS H. D. Valliant (Rarch Physics Branch, Department H. D. Valliant (Rarch Physics Branch, Department During field casts in 1980, the prototy (set standards).

Buring field casts in 1980, the prototy (set standards) and the standard produced gravity values intermedial Billy Bancarlly produced gravity values intermedial Balling Bancarlly produced gravity values intermedial Balling Bancarlly produced gravity values intermedial Balling Bancarlly produced the standard shows the batter than Balling Corrections and it date from St.-1 with no cross-coupling corrections in the parceast amounter even in cough weather this processed data from sther Bancar, these corrections the eross-coupling effects are applied through the corrected data from either Bancar, these corrections posteries course lation techniques, the current posteries correlation techniques, the current (dagmen of smoothness) of the respective data spraint within 3 percent for sach meter. These results similar within 3 percent for sach meter. These results similar than cross-coupling errors have been virguilly that cross-coupling errors have been virguilly allainated in the new gravimeter.

#### Geomagnetism and Paleomagnetism .

Osorne L. Signos (Department of Atmospheria Sciences) Delversity of California, Los Angeles, 90024), Emerica L. Veromb

average rate exceeded two per year. This is more than a factor of 20 greater than the inferred present rate. There is a 50 percent probability that the average rate exceeded eight per year, more than a factor of 80 greater than the inferred present rate. The calculated rates of auroral incidence can be used to estimate the medieval position of the geomagnatic pole. In both of the probability examples cited, the pole was located in the Eastern Hemisphera. In the first was located in the Eastern Hemisphera. In the first example it would have been displaced 9 degrees from the geographic pole. (Falconagnetism, aurora, secular variation).

Geophys. Res. Lett., Paper 31,0305

2560 Time variations, paleomagnatism BIGE MEDIEVAL AURORAL INCIDENCE OVER CHINA AND JAPAN; DEPLICATIONS FOR THE MEDIEVAL SITE OF THE GEOMAGNETIC FULE George L. Siscos (Department of Atmospheric Sciences, University of California, Los Angeles, 90024), Kennoth , Varosub

University of California, Los Angalus, 90024), Rempeth L. Varcoub

The catalog of historical oriental aurorse compiled by Kaimatsu lists 116 aurorse from China and 31 aurorse from Janna in the partial 801 to 1400 Ab. The two listings have no events in common. If they are considered as Independent random samples from the same population, the lack of overlapping avents can be used to determine the probabilities of different medieval auroral occurrence fraquencies aven the China-Japan quarter. We find that there is a % portent prohability that the average rate succeeded the inferred presentity that the average rate succeeded the inferred presentity that the average rate succeeded the inferred presenting the promote that a factor of 20., This corresponds to a geomagnetic pole located in the Eastern Hemisphere displaced more than 9 degrees from the geographic pole. (Paleomagnetism, surors, secular variation).

Geophys. Res. Lett., Paper 310305

#### Hydrology

Iljo Groundwater
INDITITIONS SOURCES OF GROUNDWATER POLLITION:
AN OPPULMENTOR APPROACH
S. M. Gorelick (U. S. Geological Survay, Manio Park,
California, 94025), S. Evens and I. Resson (Papartment
of Applied Earth Solences, Stanford University,
Stanford, California, 94305)
Least squares respectation and linear programing for
least absolute error estimation are each combined with
groundwater solute transport simulation to identify the
locations and magnitudes of aquifer pollutant sources.
Follutant sources are identified by matching simulated
and measured non-resocing solute concentration data.
We have assumed known hydraulic parameters but considered concentration data errors explicitly. The
Identification models are demonstrated and compared
using two hypothatical aquifer systems, one for the
steady-state models identified unknown pipe leak locations and leak magnitudes based upon sparse and apatistly distributed chloride and tritium data. The
number of likely leak locations was restricted in the
models by exploying mixed-integer programing and stepvies suitiple regression. Transfamt models identified
upon concentration histories collected at observation
walls. In this case conservative solute concentration
date were abundent and contained subscantial errors.
Hinimising either least absolute or least squared errors
was successful in identifying pollutant sources. Furtharmore, we demonstrate error analysis for the results
fiven by either method.

Mater Resour. Res., Paper 190406

3199 General or miscellaneous Thermal hydrology and heat flow of browave geothermal Area, hevada Christian Smith (Formerly Kerth Scionce Leboratory, University of Utah Rosearch Institute, Seit Lake Giry; Presently Chevron Resources Co., P.O. Box 7147, San Vranciaco, CA 94107-7147)

Particles and Fields—

Inflactions in temperature-depth profiles from forty 150 a thermal gradient holes define a shallow thermal flow system in the Whirlwind Valley near the Benowaw Guyaran IV.S. Geological Survey bydrologic date reveal the water table above the water table above the water table above the manufactural inflactions break most abruptly in a rease with a downward component of flow at the water table. The inflactions break most abruptly in a rease with a downward component of flow at the water table. The inflactions are thought to indicate the lavel where the buoyant thermal water anintains a dynamic equal the water table. The inflactions are thought to indicate the lavel where the buoyant thermal water anintains a dynamic equal the water table. The inflactions are thought to indicate the lavel where the buoyant thermal water anintains a dynamic rease with a downward component of the series of the understand the helpful in assessing the potential for energy production. The systematic acquisition of hydrologic data is recommended as a standard component of hydrocherual resource exploration programs.

Restracted Ultraviolet Day Atronous for the series of the states of the stat

#### Meteorology

3715 Chemical Composition
FOGMATER CHEMISTRY IN AM URBAN ATMOSPHERE
J. W. Mungar, D. J. Jacob, J. W. Waldman and M. R.
Boffmann (Environmental Engineering Science 135-78,
California Institute of Technology, Pasadema, California,
61124)

Barch and Dapartment of Machanical Engineering, State Shivarrity of New York, Stoay Brook, New York, 11794), Richard V. Stewart Richard W Stream fork, Stoay Brook, Saw York, 11794), A sonally, verticelly and annually averaged numerical social of crace gases in the troposphere is used to excense the crace gases in the troposphere is used to excense the control of crace and the control of latitude. Foregassas included in the cases hunget are: a source sphere, descontion at earth's surface, north-south diffusive transport and photo-charical reactions. Semailating vertained and concentrations to the court of the variation and magnitude of the stratuspheric source is presented. The model indicates a nat photo-chanical spurce of oxona in the northern hamisphere and a net chanical sisk in the tropical latitudes. Calcuin qualitative agreement with observations. (Tropophere, coses)

phys. Res., Green, Paper 3G0279

3745 Gravity Wayns, Tides, and Compressional Wayns A MUMERICAL HUMER, OF GRAVITY WAYN BREAKING AND STRESS IN THE MESOSPHYRE R.R. Schoeberl, D.F. Strobel, und J.F. Aprusess (Plasas Physics Division, Havel Research Leboratory, Washington, D.C. 21075)

The stresses genorated by breaking gravity waves in the unscepbers are calculated with a numerical model of steady vertically propagating gravity waves which lockudes wavelangth dependent radiative despited includes wavelangth dependent radiative dissipation and turbulent viscosity and conduction. The principal finding; grav (1) waves do not break for 10-el values 5 20 ms as radiative despite prevents wave amplitude growth with elititude for short vertical wavelengths; (2) the downward hear firm dus to turbulence of breaking waven and curbulant bearing through loss of wave senergy could severely affect the global radiative energy balance; and (3) predicted sonal deceleration for steady breaking wave is stronger than required by Aprusess et al. [1982] for the sense directation. Goverty wave breaking wave is stronger than required by Aprusess et al. [1982] for the sense directation. Goverty wave breaking wave is stronger than required by Aprusess et al. [1982] for the sense directation. Goverty wave breaking wave actual produce an ediabatic wasosphare with a sonal sense walled produce an ediabatic wasosphare with a sonal sense walled produce an ediabatic wasosphare with a sonal sense walled produce to the plass speed of the breaking wave.

Diffusive transport of constituents and potential temperature by breaking gravity wave turbulence is shown to be important. In the cases of sixtle outde and atomic oxygen the vertical addy diffusion coefficients are shown to be emaitive functions of their respective chemical loss trace in the mesosphere and lower thermosphere. (Gravity waves, wave breaking, mesosphere).

J. Goophys. Res., Green, Paper 300347

3770 Meteorology (Particles and Associate) LIDAE GREENATIONS OF THE EL CRICEON DUST CLOUD AT 2308

LIGAR OBSERVATIONS OF THE EL CRICGON DUST CLOUD AT 23°9

B. R. Clemasha (Institute de Pasquimas Espaciais, S.J. dos Campes, S.F., Brazil) and D.H. Simonich

Lidar observations of the stratespheric aerosol scattering at Sim José dos Campes (23°9, 46°W) show a very large increase in the stratespheric serosol burden to have occurred in mid-1962. Pask scattering ratios greater than 5 have been observed, as compared with pre-embanecement values between 1.1 and 1.2, representing an increase by more than an order of magnitude in particulate scattering. It is concluded that the main source of the dust twa the exception of El Chichón in Magleo in late March and early April of 1982. (Stratespharic serosols, volcanic eruptions).

Geophys. Res. Lett., Paper 31,0329

#### Oceanography

4760 Sea Ice
SENSITIVITY STUDIES WITH A COUPLED ICE-OCEAN MODEL OF
THE MARCHAL ICE ZONE
L.P. Read (Research Division, Det norske Veritas,
P.O. Box 300, N-1322 Noewik, Norway)
An analytical coupled ice-ocean model is considered
which is forced by a specified wind-stress acting on
the open ocean as well as the ice. The analysis
supports the conjecture that the upwelling dynamics
at ice edges can be understood by means of a simple
analytical model. In similarity with coastal problems
it is shown that the ice edge upwelling is determined
by the net mass flux at the boundaries of the considered region. The model is used to study the sensitivity
of the upwelling dynamics in the marginal ice zone to
variation in the controlling parameters. These parameters consist of combinations of the drag coefficients
used in the parameterization of the stresses on the
three interfaces atmosphere-ice, alwapshere-ocean and
ice-ocean. The response is shown to be sensitive to
variations in these parameters in that one set of paramaters may give upwelling while a slightly different
set of parameters may give downwelling.
ice edge motion).
J. Goophys. Rea., Green, Paper 300403 ice edge motion). J. Goophys. Ras., Graca, Paper 300403

AMALYTICAL YIELD SPECTRUM APPROACH TO BLECTRON ENGRGY DEGRADATION IN EASTH'S ATMOSPIERS 8. A. Haider (Applied Physics Section, Institute of Technology, Banaras Hindu University, Varanasi, 221005, India) and R. P. Singhal.

Analytical spatial yield spectrus approach has been applied to ediculate the electron flux, volums excitation and ionization rates for momenergetic electrons incident on the earth's atmosphere. The results have been compared with the previous model calculations of Hantas and Walker (1976) and Banks et al. (1974). (Electrons, ionization).

J. Geophys. Res., Blue, Paper 340157

5520 Electric fields
LATITUDINAL AND MACHETIC FLOX TUBE EXTENSION OF THE
EQUATORIAL SPEEAD F IRREGULARITIES
M. A. Abdu (Institute de Pesquises Especiais - IMPE,
Conselho Escional de Desembolvimento Clentifico e Tennológico - CMPe, 1220 - São José dos Compon, São Paulo, Brazil), R. T. de Madeiros, and Y. Maksaura California Institute of Technology, Pessadens, California, Sil25)

Analyses of fogueter collected by inertial impaction in the Los Angeles basin and the Sen Josquin Valley indicated amountally high concentrations of major end stated amountally high concentrations of major end stated amountally high concentrations of major end states and amountally high concentrations of major end states and according to the Los Angeles basin and the Sen Josquin Valley.

Maximum observed values for NHF. MOJ and SOA\* were loss 1.2. Iron and lead concentrations over D.1 set and 0.01 set, respectively, were observed. High concentrations of chamical components in log appeared to correlate well with the occurrence of smog events. Light, dissipating fogs routinely showed the highest concentrations of condensations and exportation. Light, dissipating fogs routinely showed the highest concentrations condensation models, nitrate someoging, condensation, ascrosol hase).

Ji. Geophys. Res., Green, Paper 100293

Ji. Chemical composition and chemical interactions. LATTUDURAL VARIATION OF TROPOSPHERIC OXORE IN A PROTO-SPICE Concentration of the irregularities in functional for making to the control of the irregularities. Another is all the approximate duration of a spread y event over fortales. Possible implications of these results only for those that have duration of a spread y event over fortales. Possible implications of these results only for those that have duration of a spread y event over fortales. Possible implications of these results only for those that have duration of a spread y event over fortales. Possible implications of these results only for those that have duration of a spread y event over fortales. Possible implications of these results only for those that have duration of a spread y event over fortales. Possible implications of the service of a large of spread y event over fortales. Possible implications of the service of search possible implications of the irregularities.

JIS Chemical Composition and chemical interactio

5535 Interactions Between Waves and Perticles
DIRECT OBSERVATION OF RADIATION JELY ELECTRONS
PRECIPITATED BY THE CONTROLLED INJECTION OF VLY
BIORALS FROM A GROUND-BASED TRANSMITTER
W. L. Dabof (Lockhead Jalo Alto Engerum Laboratory),
1251 Hanover St., Eldz. 255, Falo Alto, Calif. 34504),
1. B. Keagan, H. D. Yoos, X. E. Cainas, D. W., Batlowe,
1. Mobilis, R. A. Bellivell (Etasford University), U.
B. Inan, J. Rathufrikis, and R. G. Jelnet (Office. of
Havel Remearch)

Endiation boit electrons precipitated by controlled
Injection of VLF signals from a ground based transmitter
tor have been directly observed for the first time.
These observations were part of the SETP (Stimulated,
Datesion of Energetic Particles) experience conducted

amentive low mititude matchilite payload to detect the pracipitation. An obtaineding armsple of time-correlated wave and particle data occurred from 8680 to 8740 ascoods U.T. on 17 August 1982 when the astellite passed near the W.F transmitter at Cutler, Maine (EAA) as it was being modulated with a repeated ON (3-9)/077 (2-9) pattern. During sate of twelve consecutive pulses from the transmitter the electron counting rate increased significantly after what of the DV particle and reached a maximum shout 2 asconds later. The measured unarry spectra rewealed that approximately 19 to 50 percent of the shanced electron flux was concentrated man the resonant suergles for first order cyclotron interactions occurring dloss to the magnetic equator with the nearly somethrowatic waves smitted from the transmitter.

3543 Ionsepheric disturbances
UMIFIED TEMORY OF TIPE I AND TYPE II IRREGULARITIES
IN THE EQUATORIAL ELECTRONET
E. M. Sudan (Laboratory of Plasma Studies, Cormell
University, Ithacs, New York 14853)
A monlinear unified theory of type I and II irregulerities is presented which explains their principal
observed cheracteristics. The power spectrum is
predicted using Kolmognoff type conservation haw for
the power flow in cascading eddies. (type I and II
irregularities, equatorial electrojet, nonlinear
unified theory) unified theory) J. Geophys. Res., Blue, Paper 3A0371

EFFECT OF AS ELECTION SEAM ON THE CURRENT-CONVECTIVE INSTABLLITY
P.K. Chetured and S.L. Ossekov (Code 4700, Mavel Research Laboratory, Vashingtoo, D.C. 20575)
We consider the possible effects of an electron beam on the current-convective instability in a weakly-lonized plasma, with spolication to the diffuse auroral situation. A linear stability smalysis including these effects is presented. It is found that the presence of an electron beam has negligible effects on the instability growth rate for the diffuse auroral lonospheric application. (Siedtron beam, convective instability, diffuse aurora)
J. Geophys. Ros., Siue, Paper 180314

5345 Tomosphatic Disturbences
SHORT NAVELENGTH STABILIZATION OF THE GRADIENT DRIFT
LUSTRABILITY DUE TO VALUGITY SHEAR
J.D. Habe (Geophysical and Flasme Dynamics Branch,
Plasma Fhysics Division, Mavel Research Laboratory,
Neshington, D.C. 20373), L.C. Lee (Geophysical
Institute, University of Alaske, Feitbenks, Alaska
99701)

institute, university of Alaska, Paithanka, Alaska 19701)
A conlocal analysis of the gradient drift instability is presented. The new effect included in this theory is the allowance for an inhomogeneous electric field which produces a sheered drift velocity. It is found that velocity when can stabilite the short vavelength modes of the instability, and preferentially excits a longer wavelength tode then would be expected based upon local theory. This result may explain the observations of dominant, long wavelength irregularities in the equatorial electrojet (Mudoki et al., 1982; fight at sl., 1982) and be relevant to irregularities in the averal ionosphere.

Geophys. Res. Latt., Paper 3LD331

NOS

R. T. Teunoda (Radio Physics Laboratory, SRI international, Penio Park, CA 94025)

The west wall of large-scale "upwailings" that develop
in the bottomaide of the nighttion equatorial 7 layer
bacones structured by the wind-driven gradient-drift
instability, the same process that ladds to the formation of strictions in barium ion clouds. Upwailings
are intilated by waveline party-parious with lone ation of strictions in barium low clouds. Upwellings are intitated by wavelink parturbations with long apatial wavelengths '- 400 km; and are amplified by the collisional Rayleigh-Taylor instability and constimes assisted by the gradient-drift instability in the case of an upward moving Flayer; The west-wall structuring process is driven by an eastward nautral wind enhanced by reduced drag during the post-summet hours and a velocity shear is east-west bulk planes that in the butterpart in a set-west bulk prised that the bucket, and i had well but prised that the true evolve in a manner analogous to primary plaums bubbles; i.e., secondary plaums bubbles grow from the west wall. Their characteristics are compared with those of the primary bubbles and discusse in the light of existing theories. Equatorial spre F, equatorial irregularities, pissue bubbles, grading drift inequality). J. Guophya, Pes., Blue, Paper 3A0392

5560 Particle precipitation
SAICLUIE AND GROUND DBSCRVATIONS OF A PRE-SUBSIDEM
PMASE ON a May 1977
Aarne Banta and Milible Ranta (Gaophysical Observatory,
SF-99600 Sodankylä, Finland)
On a May 1977 a polar orbiting low-militude DMSP
eatmilite passad close to the Finnish riomater
stations, at the same tice as an absorption bay
preceding an onest of substorm was observed. The
combined ground and satellite measurements show
that the absorption bay was characterized by intense
precipitation of encretic slatterns at the inner

precipitation occurred in a narrow band of latitude, perhaps less than 50 to wide. We suggest that the pre-bus precipitation was due to strong pitch angle diffusion and/or scatter of energatic electrons at the inner border of the plasma wheat, probably from the outer radiation zone. (Substorm,

5560 Particle precipitation
A THEORETICAL APPROACH TO THE MORPHOLOGY AND THE
DYNAMICS OF DIFFUSE APPORAL ZONES
D. Fourtaine (CHET FORPE, 18-40 run du Général Leclere,
92131 - Issy-les-Kouliussum, France) and M. Blanc.
Direct observations of the high-latitude lonosphore
have established the continuous presence of large-scale smissions, referred to as diffuse auroras. Meglecting located atructures, such as discrete arcs, we loccue upon a quantitative description of the coupling of
the large-scale processes of convection and diffuse
pracipitation.

The transport of 100 eV-10 keV electrons from the
geomagnetic call carthward by the convection alactive
field, and their pitch-magle diffusion into the losscome by vave particle interactions, are believed to be
the main cause of diffuse suroral electrom precipitation. A self-consistent treatment belanting wave genexation and particle diffusion appears to be still
beyond the present state of the att.

For the unin purpose of magnetospheric convection
modelling, we propose as simplified approach to this
problem, and test its validity against direct observations of the location and dynamics of diffuse surorat emissions. Uning basically the strong pitch-angle
diffusion light is the way proposed by Kennel (1969),
we derive a set of fluid equations describing the threedimensional transpart of plasma-sheet electrons. Their
integracion provides the latitude and local time distribution of precipication fluxes and characteristic energive at the top of the locansphere as a function of the
large-scale dawn to dusk electrostatic patential drop.

The calculated expansion of the suroral valu with
ungnotic activity deduced from our model, approaches the
experimental results. So this simplified theoretical
etudy permits us to reproduce and explain the main tharacturisation of the diffuse auroral vone. However, for
high values of onegnetic activity, the theoretical reduits are found to be shifted polouard relative to the
observacions. It suggests that the essump

5570 Total electron toutent.
ON THE FORMATION OF DAYTHE TROUGHE IN THE F-REGION WITHIN THE PLASMASPHER.
J. V. Ewass (MIT Lincoln Laboratory, Lexington, Masschasette 02173), J. M. Hout and R. H. Wand.
Abstract. We have reported previously Millstone Kill incoherent scatter reder observations of a trough that formed at the incomplere near A = 55° during the dayline (on 2b February 1979) in association with very distorbed computic conditions. In this waper, we report differential-Doppler observations of latitudinal variations of total electron content made at Hillstone Hill over the two-year period 1971-1973, during which data were collected for over 2,000 passes of the polar-orbiting Navy Navigation Serias satisface is a rare but not unique event. Such trough were seen on six days during this observing campaign at A < 66°; all of these were magnetically distorbed days and occurred in winter. These troughs were seen to move rapidly equatorwards during the course of the afternoon. This suggests that they represent the argnature of some enternally impressed effect such as as inconse electric field as was found to be the case on 26 February 1979. We suggest that these troughs are the ionospheric mignature of electric fields impressed into the tomospheric with the charge distribution in the magnetosphers of the partial ring current.

Geophys. Nos. Lett., Paper 31.0327

5599 General or Biscaliancous SOUDER-ACCRUSATED PARTICLES OBSERVED ON ISIS H.G. Jacob (Communications Research Centre, Department of Communications, Ottava, Canada K28652) The soft-particle spectrometers aboved the section of the soft of the section of the sect

The soft-particle spectrometers showed the 'n''' 12'' I had 12'' I

#### **Atmospheric and Oceanic Physics** Volume 18. Number 10

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